

and 150 fathoms, both in the vicinity of Gaspé and in Cabot Strait, ranges in density from 1.0254 to 1.0261. The density of this deep water is very interesting in affording an explanation for the otherwise anomalous fact that the colder water at 50 fathoms is found to float upon it. It also corresponds with the density at similar depths, off the coast of Nova Scotia.

Current across the Gulf area.—The general connection of the Gaspé and Cape Breton currents became evident when it was ascertained that the water of lower density kept to the south-western side of the Gulf. The observations of the current in open, and the reports from steamships, also accord with a general movement of the water towards the south-east, as this is the more usual direction, and the currents which are found at times to run across this prevailing direction are to be attributed to the influence of the tides and the wind.

As to the route taken by the water in traversing the Gulf from the Gaspé region to Cape Breton, it seems fair to conclude, from the evidence furnished by the density observations, that the greater proportion finds its way eastward between the Magdalen Islands and Prince Edward Island, while a certain amount may also pass north of the Magdalen Islands, on the line from Bird Rocks to St. Paul Island. It is probable, also, that some of the water may come from Northumberland Strait, as the water there is also low in its density.

For a discussion of the probable reasons why the water of lower density keeps to the south-western side of the Gulf, the Reports of the Tidal Survey may be referred to.

The St. Lawrence River in relation to the outflow from the Gulf.—It can hardly be doubted that the low density of the water in the Gaspé Current is to be attributed to the outflow of the St. Lawrence River; and we are thus able to trace the influence of this water as far as Cape Breton, where it finally mingles with the water of the Ocean. The volume discharged by the St. Lawrence has been measured at different seasons, and with the addition of the principal tributaries along its estuary, the total volume of fresh-water discharge would probably amount in all to 340,000 cubic feet per second. This volume of fresh water will mingle with sea water for which we may assume a density of 1.0240, as this may be taken to represent either the mean density of Atlantic coast water to a moderate depth, or the density of the saltier water in the Gulf itself. Under these conditions, the fresh water of the St. Lawrence would be sufficient to furnish a stream of water reduced to the lower density of 1.0230 which would be twelve miles wide and 68 feet deep, and moving with a speed of one knot per hour. This would represent the average density of the Gaspé Current, and would probably be an approximation to its average speed and its volume; and such a comparison may therefore serve to illustrate the way in which the conditions may be accounted for, if the data themselves were more closely known.

It is to be noted, however, that as regards volume the St. Lawrence River is almost insignificant as compared with the outflow of the Gaspé Current. This current, whether it flows near the coast or in the middle of the passage between Gaspé and Anticosti, has usually a width of about twelve miles. The total depth immediately off this coast is over 100 fathoms, and the depth or thickness of the current itself was ascertained from measurements of the under-current taken as far down as 30 fathoms, at times when the surface speed varied, as usual, between one and two knots. It results from these measurements that we may consider the volume of this current to be represented by a body of water 12 miles in width, with a mean depth of 30 fathoms, and moving with an average speed of 0.68 knot per hour, throughout this depth.

Such a current has a volume forty-three times greater than that of the St. Lawrence River. The volume of the Cape Breton Current, also, is probably much the same. These outflows must therefore be replaced by a return movement at the entrance to the Lower St. Lawrence, somewhere in the Anticosti region; and also by a return flow from the Ocean into the Gulf area, as the discharge of the St. Lawrence furnishes less than 3 per cent. of the amount required in either case.

The current which usually makes inwards around Cape Ray on the east side of Cabot Strait may be sufficient to compensate for the outflowing water of the Cape Breton Current; although it is also possible that the outflow from the Gulf may be partly made up for by the difference of flow in the inward direction through Belle Isle Strait, which in some years may be considerable in the early spring. This inflow at Cape Ray is in continuation of the general westward tendency of the water along

the south coast of Newfoundland. The quiescence of the deep water in Cabot Strait is also to be noted in this connection.

It may be well to remark, however, that although the outflowing water of the Cape Breton Current is much warmer in the summer season than the incoming Atlantic water, it is not so at all seasons of the year. While it is probable that the total result is on the side of loss of temperature to the Gulf area, it would require extended observations throughout the year to ascertain the amount of loss and the probable effect, in consequence, upon climate in the surrounding regions.

The Current in Belle Isle Strait, in relation to the Gulf area as a whole.—On account of the tidal character of the current in Belle Isle Strait it is clear that no great volume of water can enter the Gulf of St. Lawrence from that quarter.

During the summer season the current flows in the Strait with a speed which is nearly equal in each direction; and there is only a difference in favour of inward flow to the west, which on the whole does not probably amount to more than a moderate percentage. From the discussion of all the evidence secured, it is perhaps possible that in the early spring the preponderance of inward flow may be proportionally greater than at other seasons. But no reasons have been found for supposing that this water passes completely round the west coast of Newfoundland and finds its way out into the Atlantic through Cabot Strait, between Cape North and Cape Ray, in accordance with the theory which has been more or less accepted up to the present time. All the indications are against this theory, as they show that any general current across the extent of the Gulf must lie in an entirely different direction. The reasons for this conclusion are discussed in the Tidal Survey Reports, in which the tidal character of the flow in this Strait is described and the relations of the current to the tide, the temperature of the water and the drift of icebergs are fully explained. A diagram showing the flow of the current in the two directions as observed is also given.

General Circulation in the Gulf.—In reviewing the movements of the water, with a view to tracing the general circulation in the Gulf, it is the principle of the balance of flow which is the most evident. Wherever a current of a constant character occurs, there is a corresponding return current to make up for it. Thus in Cabot Strait, the outflowing water in the Cape Breton Current is balanced by the inflow at Cape Ray; the north-eastward current on the west coast of Newfoundland is balanced by the contrary direction of the movement on the opposite shore; and we have fairly good indications of a return flow to compensate for the Gaspé Current.

It is this balance of flow which points to the nature and direction of the circulation of water in the Gulf. If we begin to trace it from Cabot Strait, where the balance between the Gulf and the Ocean takes place, the inflow at Cape Ray appears to diffuse itself more or less widely over the central part of the Gulf, but it regains its strength further north on the west coast of Newfoundland, and makes a deep bend into the north-eastern angle of the Gulf, and returns westward along the north shore. On reaching Cape Whittle it still makes westward; and, whether as an actual set or by displacing water which comes more directly from Cape Ray, it appears to work around the eastern end of Anticosti, and so compensates for the outflow of the Gaspé Current, from the estuary of the St. Lawrence. This current, after rounding the Gaspé coast, makes south-eastward as a general set or drift across the Gulf to the western side of Cabot Strait; and its waters there leave the Gulf in the outflow of the Cape Breton Current.

It also appears that the whole of the balance or compensation in the Gulf currents takes place at the surface and in ordinary under-currents, which do not probably extend to a greater depth than 50 or 60 fathoms at the most. There is nothing, therefore, to show the necessity for any appreciable movement in the deep water from 60 to 80 fathoms downward, which lies in the deep channels of the Gulf. Where direct observations have been obtained, this deep water appears to lie quiescent, without any movement that can be detected.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

PROF. T. HUDSON BEARE, professor of mechanical engineering at University College, London, has been appointed to the Chair of Engineering in the University of Edinburgh, in succession to the late Prof. Armstrong.

MR. J. W. PULSFORD, late scholar of Sidney Sussex College, Cambridge, and second master of the Dorchester Grammar School, has been appointed a junior mathematical teacher in the Merchant Venturers' Technical College, Bristol.

SIR W. H. PREECE, K.C.B., F.R.S., will distribute the prizes and certificates to the students of the South-Western Polytechnic, Chelsea, on Saturday. The laboratories will be open for the exhibition of apparatus and experiment, and short lectures will be given in the course of the evening.

THE movement in favour of the establishment of a Liverpool University has received an impulse by the offer of Mr. A. L. Jones to contribute 5000*l.* towards that purpose. With the University College as a centre of activity, and the interest taken in educational matters in Liverpool, the movement ought soon to assume a practical form. At a special meeting of the council of University College, held on Tuesday, the following resolutions were adopted:—(1) That, while gratefully acknowledging the advantages which have accrued to University College, Liverpool, by its association with Victoria University, this council is of opinion that a University should be established in the city of Liverpool; that this council will welcome a scheme with this object upon an adequate basis; and that a committee be appointed to consider and report upon the whole question, with power to make inquiries and to communicate with other bodies. (2) That the committee consist of all the members of council, with power to associate with them any other persons whom they may think fit.

SIR WILLIAM HART DYKE presided at the annual meeting of the Association of Technical Institutions on Tuesday, and delivered an address, in the course of which he dealt with the necessity of a coordinated educational system, educational and industrial progress in America, the educational crisis produced by the decision as to the limitation of the powers of School Boards as regards higher grade and evening continuation schools, and the constitution of local authorities to be responsible for educational provision. Several resolutions were passed, among them being one approving the main provisions of the Secondary Education Bill, 1900, and hoping that the new Education Bill promised by the Government will prevent unnecessary and wasteful overlapping and competition between the educational work of School Boards and County Councils.

AT a meeting of Convocation of the University of London, held on Friday last, a resolution was carried to the effect:—"That the life composition fees paid by the graduates in lieu of annual subscriptions to Convocation, being the capital of the University, ought not to be retained by the Treasury; and that the Senate of the University be hereby requested to represent to the Chancellor of the Exchequer that the University is the equitable owner of the same." In proposing the resolution Prof. S. P. Thompson compared the London University with other Universities as regards the support given to it. He pointed out that the University of Berlin has 5140 students and that the State subvention is more than 105,000*l.* per annum, making about 21*l.* per student. The University of Rostock, with 514 students, has a State subvention of 17,000*l.*, or about 33*l.* per student, and the annual State subvention at Strassburg amounts to 44*l.* per student. The University of Edinburgh, with 2780 students, has a Parliamentary grant of 25,870*l.*, or about 9*l.* per student; and the University of St. Andrews, with 236 students, enjoys a grant of 10,800*l.*, or 45*l.* per student per annum.

To all who are interested in the subject of education in country districts we recommend for serious consideration a small pamphlet which we have received from the Board of Education and which bears the title "Specimen Courses of Object Lessons on Common Things connected with Rural Life and Industries for all Classes in Rural Schools." It has long been recognised by educational authorities that there should be a differentiation between urban and rural education, and two years ago Sir John Gorst, in the course of a speech delivered at the Countess of Warwick's school near Dunmow, dwelt upon this necessity with his accustomed vigour of expression. Since that time the Agricultural Education Committee have been working most energetically to bring about this much-desired result, and the manifesto of the Board of Education may in some degree be looked upon as one of the practical issues of the voluntary labours of the gentlemen composing that Committee. Of course in all educational reforms in this country the usual difficulties of vested interests, inelasticity of teachers, hostility

of those who fail to see the importance of nature knowledge, &c., have to be faced and, if possible, overcome. The schedules now issued should go a long way towards removing these difficulties, and it is satisfactory to learn from the introductory statement that the schemes submitted are actual examples of attempts now being made to adapt the teaching in rural schools to the requirements of country life. One paragraph, pointing out the connection of the new schemes with other studies, strikes us as being an admirable answer to those objectors who declare that the introduction of these rural subjects entails the subordination or suppression of other necessary subjects. It is shown most conclusively in this paragraph that no additional burden is imposed upon the teachers or pupils, but simply a "change in the contents of the lessons in the ordinary subjects." The Board recognise that the desired change can only be brought about gradually. It is not often that we find a Government Department actually in advance of the times, but in the present case we certainly must credit the Board of Education with having made a most important step in the right direction.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, April 2.—Dr. Albert Günther, F.R.S., vice-president, in the chair.—Mr. G. P. Mudge read a paper on the myology of the tongue of parrots, and added a tentative classification of this order of birds placed upon the structure of the tongue. This memoir was the outcome of an examination of the tongues of fifty-three parrots ranging over the whole order, the Cyclopsittacidae excepted; and the conclusion arrived at by the author was that the parrots, by the structural characters of the tongue alone, might be arranged in three families, viz. Loriidae, Nestoridae and Psittacidae.—A communication was read from Prof. W. Blaxland Benham on the larynx of a roqual whale (*Balaenoptera rostrata*) and of a cachalot of the genus *Cogia*. The paper was based upon an examination of the larynxes of specimens of these cetaceans, which had been washed up on the coast of Dunedin, New Zealand, and in it the author showed how widely different this organ was in these representatives of the Mystacoceti and the Odontoceti.—A communication from Mr. F. F. Laidlaw contained an account of the lizards collected during the "Skeat Expedition" to the Malay Peninsula in 1899-1900. Twenty-seven species were enumerated in the paper, and notes were given on their geographical distribution and habits, special attention being directed to the curious habit of *Tachydromus sexlineatus* of running about on the top of the long buffalo-grass. One new species was described, under the name *Lygosoma floweri*.—Prof. D. Arcy W. Thompson, C.B., read a paper on the pterylosis of the giant humming-bird, *Patagona gigas*.

Entomological Society, April 3.—Mr. Charles G. Barrett, vice-president, in the chair.—The Rev. A. E. Eaton sent for exhibition, on behalf of Mr. F. M. Halford a ♀ sub-imago of a species of *Ephemeridae* of the genus *Ephemera*, received from Central Africa, without more precise indication of locality, this being the first time this genus has been noticed from Africa.—Mr. McLachlan remarked that *Ephemera* usually occurred in cold alpine or temperate regions, and that the Central African example probably inhabited the mountains at a considerable altitude.—Dr. Chapman exhibited cases of *Luffia ferchaultella* from Cannes, and a spider, which are found on the same rocks, the interest of the specimens being in the fact that the spider when at rest has almost precisely the same form and coloration as the cases of the moth.—Mr. W. L. Distant communicated a paper entitled "Enumeration of the Heteroptera (Rhynchota) collected by Leonardo Fea in Burma and its Vicinity."

MANCHESTER.

Literary and Philosophical Society, April 2.—Prof. Horace Lamb, F.R.S., president, in the chair.—Mr. W. E. Hoyle exhibited an old form of dial, bearing the name "Nathaniel Jeynes" and the date "1678," which had on one side a small circular rotating plate inscribed with the circumpolar constellations.—Mr. C. E. Stromeyer mentioned that on several occasions he had seen the sun's rays converging to a point directly opposite to the sun. In one case, when the sun was very low on the western horizon, some very marked rays, caused by a low bank of clouds, converged to a point above the eastern horizon.